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SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

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I. GENERAL

Soviet IGY Bibliography for Popular Reading

Ye. O. Kagarova has compiled an 18-page index to the literature (Chto chitat' o Mezhdunarodnom geofizicheskom gode [What to Read on the International Geophysical Year]) as an aid to the reader and public library. The bibliography is issued by the State Republic Library of the Georgian SSR imeni K. Marx, Ministry of Culture Georgian SSR in 500 copies. (Knizhnaya Letopis', No 17, 1958, p 102)

A New Geophysical Station Is Planned

The present geophysical station located next to the "Georgi Dimitrov" Agriculture Academy is unsuitable because of interference from nearby streetcar and trolley lines.

A new geophysical station will be constructed in an open area about 1 1/2 kilometers west of Gorna Banya, Kirkov Rayon of Sofia City. Completely modern seismographical apparatus will be installed there.

Purposes of the station will be to note and study the various types of earth tremors, to study methods in magnetic and gravimetric measurement, and to work out electrical and seismic laboratory problems.

The seismic study will greatly facilitate building projects by determining the seismic conditions of the regions designated for prospective construction.

The geophysical complex will include a seismographic pavilion, a technical research studio, a laboratory building, administration buildings, and housing facilities.

Construction of the complex begins during the second quarter of this year. (Sofia, Narodna Armiya, 6 Apr 58, p 1)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Diversified Soviet Approaches to Ionosphere Study

Systematic soundings of the upper atmosphere by wide networks of Soviet ionosphere stations in the Soviet Union, the Artic, and Antarctic, together with observations of meteor trails, aurora, and air glow and

through rockets and artificial satellites are yielding valuable information on the structure and behavior of the ionosphere. Most of this information, as presented in Engr F. Chestnov's newspaper article, "Attack on the Ionosphere," has either been given wide previous treatment in Soviet publications or is generally known in the scientific world.

Chestnov cites the outstanding achievement of Soviet investigators whereby a single-stage geophysical rocket attained an altitude of 470 kilometers on 21 February 1958, a record for this type of rocket. This rocket lofted an instrumented container weighing more than 1 1/2 metric tons into the uppermost layer of the ionosphere. Successful measurements indicated that the degree of ionization, even at an altitude of 470 kilometers, was a million electrons per cubic centimeter. This information differs sharply from that of US measurements conducted at an altitude up to 380 kilometers.

Artificial Earth satellites provide the most significant means of upper atmosphere study. Through observations of radio signals from satellites, scientists have discovered a so-called wave duct in the upper layers of the atmosphere consisting of an ionized corridor along which radio waves are propagated for distances up to 10,000 kilometers.

In the words of Engr F. Chestnov, "Artificial satellites mark the advent of a new stage in the development of science. Our knowledge of the Earth and the atmosphere, the surrounding cosmic space and the sun will become more reliable, broad, and comprehensive. A more comprehensive perception of the ionosphere will lead to the furthermost development of radio engineering, create more reliable and accurate guidance of ships and airplanes using radio methods, widen application of television, and open a path in the ionosphere for new aircraft." (Moscow, Sovetskiy Flot, 26 Apr 58)

"L'Humanite" Scientific Editor Writes Book on Soviet Scientific Plans

Lucien Barnier, scientific editor of L'Humanite, Paris Communist daily, has discussed the Soviet earth satellite and space research program in a recent book entitled A Quoi Revent les Savants Sovietiques? (Of What Are Soviet Scientists Dreaming?) (Editions Mondiales, Del Duca, 2 rue des Italiens, Paris 9, 268 pp, 780 francs; for sale at 7 rue Danton, Paris 6). Excerpts from the section of the book dealing with earth satellites and their value in interplanetary travel were published in the 16 May 1958 issue of L'Humanite. Barnier described his meetings in the USSR with the Soviet scientists Nikolay Kuprevich and Gleb Chebotarev and reported statements by Yuriy Khlebtsevich and Dr Nikolayev. Kuprevich discussed his success in obtaining a televised image of the Moon; Chebotarev discussed his interest in the movement of small planets and comets and his conception of a

moon rocket. Barnier also included a discussion of Khlebtsevich's plan for sending rockets around the Moon and establishing a laboratory on the Moon and for man's scientific conquest of the Moon. Khlebtsevich also discussed rockets to Mars. Nikolayev's theses on the protection of the human organism when subjected to conditions found in flights to the cosmos were also discussed by Barnier. (Paris, L'Humanite, 16 May 58)

Collection of Articles on Sputnik II Published

Vtoroy sovetskiy iskusstvennyy sputnik Zemli (Second Soviet Artificial Earth Satellite) is a collection of articles by the Pravda Publishing House which includes the official TASS communique on the launching of the second Soviet artificial Earth satellite, articles on "Second Soviet Artificial Earth Satellite," "Observation of Artificial Earth Satellites," "The Upper Atmosphere and Its Investigation With the Aid of Artificial Earth Satellites," "Investigation of the Earth's Magnetic Field With the Aid of Satellites," "On the way to Conquest of Cosmic Space," "Penetrating the Secrets of the Universe," "The Conversation of two Sputniks," and "Around the Earth and Around the Satellites." (Sovetskiye Knigi, No 171, 1957, p 42)

Soviet Bibliographies on Artificial Earth Satellites and Space Flight

Mezhdunarodnyy geofizicheskiy god (1957-1958) (International Geophysical Year (1957-1958)) is a 383-item bibliography of books and periodical articles in Russian and other languages which is partially annotated and was compiled by the Institute of Physics of the Earth of the Academy of Sciences USSR [Address: Moskva, D-56, B. Gruzinskaya ul., 10] in August 1957.

Mezhplanetnyye puteshestviya (Interplanetary Travel) is an annotated 120-item bibliography of books, journal and newspaper articles for 1956-1957 compiled by the State Republic Library of Kazakh SSR imeni A. S. Pushkin [Address: Alma-Ata, pr. Lenina, 11]. (Informatsionnyy Ukazatel' Bibliograficheskikh Spiskov i Kartotek, Sostavlennykh Bibliotekami Sovetskogo Soyuza, No 1, 1958, p 13)

Iskusstvennyye sputniki Zemli. Mezhplanetnyye polety. (Artificial Earth Satellites. Interplanetary Flight) is a 45-page annotated bibliography of popular scientific and fiction literature for a wide circle of readers, compiled by O. N. Levshina and Z. P. Shalashova and edited by B. V. Lyapunov and issued by the State Library imeni V. I. Lenin and the Central Polytechnic Library in 26,000 copies at a cost of one ruble and 40 kopecks each. (Novyye Knigi, No 17, 26 Apr 58, p 25)

Soviet Pamphlet on Astrogeography

Astrogeografiya (Astrogeography), by I. M. Zabelin, is a brochure devoted to the new science of astrogeography which is of special interest in connection with the successes of Soviet science in the conquest of cosmic space. In popular form, the author discusses the essence of this science and its tasks, examines the solar system and compares the natural conditions of Earth, Mars, and Venus and touches on the problem of the possibility of life on other planets. The 24-page pamphlet is intended for the ordinary reader, is published by the State Publishing House for Geopraphical Literature, and costs one ruble. (Novyye Knigi, No 18, 4 May 58, p 40)

Medal Commemorates IGY

The noted Hamburg sculptor, Prof Edward Hanisch-Kunze, has made a commemorative medal in honor of the IGY. The face of the medal depicts the Earth and the Sun and bears the inscription, "International Geophysical Year 1957/1958." On the reverse side are indicated the dates of the launchings of the first Soviet and US artificial Earth satellites and the designation of their orbits. (Leningrad, Leningradskaya Pravda, 9 Mar 58)

III. UPPER ATMOSPHERE

Television Telescope in Operation at Pulkovo

The keen eye of a new astronomical instrument, a television telescope, will be fixed on Mars as it nears the Earth this year during the time of its opposition. This instrument is now set up in the Main Astronomical Observatory at Pulkovo. It was designed by senior scientific associate at the Observatory, N. Kuprevich, who coupled television apparatus with the reflecting optical system of a telescope. The image of a celestial object falls on a photocathode transmitting tube, and then it is studied on a brightly illuminated television screen.

The weak illumination of celestial bodies makes their observation difficult and their photographing, particularly so. During the period of a full moon, it is possible to see the bleak, lifeless deserts with the characteristic lunar cirques, mountain chains, crevices, and "seas." An electrical system makes it possible to increase the scale of the image, which brings the lunar disc up to 6 meters. Thus it is natural that it must be studied part by part. Tens of valuable photographs have already been made of the Moon in the observatory and also of double stars of the eighth and ninth magnitude.

Other new instruments have also appeared recently at Pulkovo. In the main pavilion stands the ZTL-180 Zenith Telescope, Leningrad, with an objective diameter of 180 millimeters and a focal length of 2,360 millimeters. This is one of seven similar type instruments built in Leningrad according to the specifications of V. Sakharov and I. Korbut, scientific workers of the observatory. The zenith telescope bears the IGY emblem on its base. Its work is specified under the IGY program.

The complement of the observatory also fulfills other tasks under this program. Workers of the Division of Radioastronomy conduct observations for radio signals from the Sun. At the disposal of the scientists is the largest radiotelescope, having a horizontal length of 120 meters.

The Pulkovo time service works according to the general plan with other Soviet time services, investigating irregularities of the Earth's rotation around its axis. This also enters under the IGY. Much interesting data was obtained at Pulkovo during visual observations of the Soviet artificial Earth satellites.

Day and night, the astronomers stand by their accurate instruments, which are mounted in high cupola-like towers. One of the senior Soviet astronomers, A. A. Mikhaylov, Corresponding Member of the Academy of Sciences USSR, heads the observatory's complement. (Moscow, Sovet Flot, 30 Mar 58)

[Note: See Soviet Bloc IGY Information report PB131632-15, May 16, 1958 for details on the TV telescope.]

Relation of the Light Intensity of a Meteor Body and its Deceleration

An article, "The Light Intensity Curve of Meteors and Ceplecha's Method of Verifying Deceleration Rate of Individual Meteor Bodies," by B. Yu. Levin and S. V. Mayeva, Institute of the Physics of the Earth Academy of Sciences USSR, appeared in the Byulleten' Komisii Po Kometam i Meteoram Astronomicheskogo Soveta Akademii Nauk SSSR, No 1, 1957, pp 29-31.

During a comparison according to Ceplecha's method of the true rate of deceleration of an evaporating meteor body with theoretical anticipation, certain functions of the density of the atmosphere and the velocity v of a meteor body are assumed to be dependent on v^2. The actual rate of this function is far from linear. If the change of values of the instantaneous intensity of the light of a meteor is also expressed as a function of v^2, then it is possible to conduct a comparison of the theoretical and actual progress of the changes of this value. For this, it is necessary to find an expression for the velocity of a changing mass as a function of v^2. A sufficiently general assumption concerning the degree of relation between the changes of mass and changes of the area of the frontal cross section of the meteor body is made. A comparison of the theoretical and actual progress of the changes in the intensity of the light of a meteor shows that verification according to Ceplecha's method is correct for the part of the meteor's course below the point of maximum light intensity. Deviation from the theoretical course can be connected with the processes of deterioration of the meteor body, of its chemical heterogeneity, etc.

(Referativnyy Zhurnal-Geofizicheskaya, No 1, Jan 58, Abstract No 720, N. D. Rozenblyum)

New Instrument for Measuring Sun's Ultraviolet Radiations

A new instrument for measuring the over-all energy and intensity of ultraviolet radiation is proposed by N. A. Lebedev and I. D. Shmerkovich in an article, "New Instrument for Measuring the Sun's Ultraviolet Radiations," which appeared in Izvestiya Krymskogo Pedagogicheskogo Instituta, No 21, 1955, pp 293-300. The instrument consists of a receiver, an integrating cell, an amplifier, and an electrical impulse counter. Two versions of the receiver were developed. The first version includes a vacuum photoelement, the SPV-4, a UFS-2 light filter, and an Ulbricht sphere with a screen. The utilization of the integrating cell from a condenser and a neon lamp make it possible to measure the intensity of the incident light according to the flashes of the neon lamp.

The second version uses two Ulbricht spheres covered with oxides of magnesium and zinc. One photoelement records all spectrum radiations, the second, only the visible. The energy of ultraviolet radiation is determined by the difference between the energy of the entire spectrum and the visible part of the spectrum. The system of this version of the receiver is a modification of a differential photometer which has an integrating cell instead of a galvanometer. The number of flashes of the neon lamp can also serve as a measure of the intensity of ultraviolet radiations. The instrument was tested and gives a good linear relationship of the number of impulses per minute to the intensity of ultraviolet radiations. (Referativnyy Zhurnal-Geofizika, No 1, Jan 58, Abstract No 717, by R. S. Steblova)

First Ionospheric Observatory Opened in Yugoslavia

"In the Observatory for Investigation of the Ionosphere, Yugoslavia has an important scientific institution which will enable the country to distinguish itself in international scientific circles and in the field of ionosphere study," stated Prof Dr Pavle Vujevic, academician and chairman of the National Committee of Yugoslavia for the International Geophysical Year, on the occasion of the opening on 22 February 1958 of the first Yugoslav ionospheric observatory.

The observatory is the first of its type in the Balkans and the only one in the entire area from Vienna to Bombay. There are only about 100 such institutions in the world.

Asked about the significance of the ionosphere recorder, Yugoslav radio technology expert Prof Dr Aleksandar Damjanovic stated: "The ionosphere recorder is a complex installation composed of over 100 tubes in which are performed very complex processes. Considering the fact that it was completely designed and built in Yugoslavia, the ionosphere recorder points to the great success of our electrical technology."

In answer to the question of a Politika representative concerning what may be expected from the observatory, Engr Aleksandar Dolinar, assistant director of the "Nikola Tesla" Institute, said: "First of all, systematic observation of the ionosphere will be conducted, without interruption, day and night, every hour. The data will represent valuable material for the study of the ionosphere. With the cooperation of the Geomagnetic and Astronomical Observatories, and perhaps the meteorological service, the new observatory will contribute new knowledge on the activity of the sun, as well as of many still unexplained phenomena in the ionosphere." (Belgrade, Politika, 23 Feb 58, p 12)

Meteor Studies at University of Jena

A science article entitled "News on Meteors," by J. Hoppe of the Observatory and Astrophysical Institute of the University of Jena, presents results which were obtained in the field of meteor investigations. The article appeared in Umschau, Issue 57, No 9, 1957, pages 263-265.

The various groups of meteors -- stream, sporadic, and interstellar -- are considered, and their origin is discussed. The principal physical processes originating during the flight of the usual meteor bodies through the atmosphere are described. Similar conditions for large bolides are considered separately. Information which it is possible to obtain with the aid of radio observations is presented. The value of radio observations for investigations of meteors in the upper layers of the atmosphere is noted. (Referativnyy Zhurnal -- Geofizicheskaya, No 1, Jan 58, Abstract No 722, by S. V. Mayeva)

Ionospheric Observations in the Arctic

"Ionospheric Observations", by V. M. Driatskiy, A. S. Besprozvannaya, and L. I. Korovina, giving the material of observations by the scientific research drifting stations Severnyy Polyus 3 and Severnyy Polyus 4, appeared in Morskoy Transport, Vol 5, 1957, pages 7-17.

The results of ionospheric observations made by the drifting stations in the circumpolar region during the period from the 15 May 1954 to the 14 April 1955 are presented. A short description of the apparatus is given. Ionosphere stations prepared by the Arctic Institute according to a design by F. Ya. Zaborshchikov were used. The station range was 1.0 to 14.0 megacycles and a pulse power of 150 to 1,300 volts. Photographing was done on standard motion picture film with a frame size of 24 by 36 millimeters. Tables of the values of the principal parameters of the ionosphere ($f^{o}F_2$, $h'F_2$, $f^{o}F_1$, $f^{o}F$, fB_s, fE_{2s}, $h'E_s$, $h'E_{2s}$, F2-M3000, and F1-M3000), an explanation to the tables, examples of high-frequency characteristics, and

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tables of the coordinates of the geographical location of the station are given. From May to September 1954 the stations moved from 86°58' N, 181°56'E to 89°07'N, 249°00E and thereafter were again shifted into lower latitudes, reaching 86°00'N, 329°20'E in April. (Referativnyy Zhurnal -- Geofizicheskaya, No 1, Jan 58, Abstract No 770)

Radio Images of the Solar Disk

The text of an article, "Radio-Imaging of the Sun on a Wavelength of 3.2 Centimeters," by V. V. Vitkevich, A. D. Kuz'min, A. Ye. Salomonovich, and V. A. Udal'tsov follows:

"In July 1957, at the Crimean Station of the Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR, a new large radiotelescope, a stationary parabolic reflector 31 meters in diameter, was put in operation. This radictelescope, which was built according to a principle devised by V. V. Vitkevich, makes possible an imaging of the sun. The precision-built reflector is a hollowed-out section of the ground which has been covered with concrete and surfaced with metal. The geometric axis of the paraboloid is oriented in the plane of the meridian and inclined at an angle of plus 22 degrees, which makes possible each year, during June and July, an observation of the radio-image of the sun. The transmitting and receiving attachment to the telescope is installed on a special carriage near the focus of the reflector. The direction of the electrical axis of the radiotelescope can be varied within certain limits in respect to both declination and hour angle by varying the position of the carriage. To scan the diagram of the radio reception at a declination during observations of a transit, a possibility is provided for an automatic return motion of the carriage in the plane perpendicular to the axis of the reflector in the north-south direction.

"In July 1957, a study was made of the two-dimensional distribution of the intensity of the radio emission of the solar disk at wave lengths of 3.2 and 10 centimeters. Modulated radiometers devised by A. Ye. Salomonvich and A. D. Kuz'min were used. The incoming signals entering the radiometers through horn radiators located in a row in the focal plane, were modulated by means of ferrites in circular wave guides. The radiometers were calibrated according to the radiation of a black body (at a wave length of 3.2 centimeters) and a gas-discharge noise generator (on a wave length of 10 centimeters). The self-recording device EPP-09 and a loop oscillograph with a time constant of about 0.2 second were used for the recordings.

"The observations were carried out as follows: At the time of the culmination of the sun, a scanning of the diagram of the radiotelescope was carried out on an angle with limits plus and minus 30 minutes by means of an automatic back and forth motion of the carriage, with radiators pointing in the north-south direction. The mean position around which the scanning

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was done was chosen so that the mean inclination of the axis of the diagram coincided with the declination of the sun at the moment of its culmination. The carriage moves from one extreme position to the other in 7.5 seconds. The sun, because of its daily motion, moved along the hour angle at an angle equal to 1.7'. This provided a recording of curves of the distribution of the intensity of the radio emanation of the solar disk on a series of successive bands in directions approximating the north-south direction. These curves represent successive sections of the surface of the two-dimensional distribution of radio intensity on the solar disk, which follow a zigzag line, the center points of which are located a certain angular distance, equal to 1.7', from one another. The total of all the curves recorded at the time of the transit of the sun through its culmination can be used to plot a two-dimensional map of the distribution of solar radio intensity. The narrow width of the diagram on a wave length of 3.2 centimeters (6' on the 0.5 level) makes it possible to produce extremely detailed maps. Because of the large width of the diagram (15' on the 0.5 level) at a wave length of 10 centimeters, the maps show only a coarse distribution of intensity areas.

"During a recording of the radio emanation of the sun on wave lengths of 3.2 and 10 centimeters, the sun gradually enters the diagram of radio reception in such a way that the axis of the scanning diagram at first is tangent to and then intersects the solar disk on chords near the edge of the disk; then those areas appear in the diagram which are near the center of the disk; gradually, the sun moves out of the diagram.

"In the process of the passage of the sun, the diagram intersects various areas of increased radio intensity which appear on the recording in the form of sharp peaks. In all, 13 recordings were obtained on a wave length of 3.2 centimeters (with 13 on 25 July) and nine on a wave length of 10 centimeters (with 17 on 25 July). On the basis of these recordings, maps of the two-dimensional distribution of radio intensity on the solar disk were prepared.

"Figure one shows the radioisophots for 3.2 and 10 centimeters prepared from recordings made on 18 and 20 July and not corrected for the effect of 'erosion,' depending on the extremity of the radio intensity diagram. Also plotted on this illustration are the contours of the visible solar disk and groups of patches according to data of the GAO (Mountain Astronomical Station).

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"The 3.2 centimeter wave length figure shows areas of increased radio intensity very irregularly distributed on the disk. The location of these areas coincides approximately with the location of groups of optical blurs recorded on these days. The radioisophots on a wave length of 10 centimeters indicate the presence of active areas, the locations of which, apparently, are approximately the same as the locations of groups of optical blurs and the areas of increased radio intensity on a wave length of 3.2 centimeters. Similar maps were examined for other days. A comparison of the radioisophots obtained on 18 and 20 July reveals the shift of groups of blurs of increased radio intensity in keeping with the rotation of the sun on its axis.

"At present, the data obtained are being processed and compared with data from optical observations." (Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 6, 21 Feb 58, pp 1,091-1,093

IV. GEOMAGNETISM

Magnetic Observations in Arctic

The material of the observations of the scientific research drifting stations Severnyy Polyus 3 and Severnyy Polyus 4 is presented in an article, "Magnetic Observations," by R. G. Kokorin, which appeared in Morskoy Transport, Vol 5, 1957, pages 198-201.

The coordinates of the locality of the drift stations from mid-April 1954 to mid-April 1955 are given. The instruments used for the determination of the absolute values of the elements of the magnetic field and for registering variations of the field are described. A short description of the performance of the instruments, the methods of preparations, and the accuracy of the results is given.

The results of the observations in the form of tables of the hourly values of D, H, and Z, the hourly amplitude of H, and the absolute values of D, H, and Z obtained from visual observations are given. The last table has a significant value, since the quantitative gaps in the recordings of the variations stations reaches 20 percent. (Referativnyy Zhurnal—Geofizicheskaya, No 1, Jan 58, Abstract No 793, by V. P. Orlov)

Theory of Magnetic Variometers

S. M. Mansurov, in the article, "Theory of Magnetic Variation Instruments," which appeared in Trudy nauchno-issledovatel'skogo instituta zemnogo magnetizma, ionosfery i rasprostraneniya radiovoln, No 12 (22), 1957, pages 91-182, gives a detailed account of the theory of magnetic variometers.

It is indicated that in any magnetic instrument, the moment of rotation, arising under the action of the Earth's magnetic field applied to the magnetic system of an instrument with one degree of freedom, is balanced by the counteraction of the moment arising under the action of the elastic forces of deformation of the suspension thread, and of the force of gravity or the magnetic field of a permanent magnet. For all single-thread variation instruments (unifilar), the torsional moment is counterbalanced by the torsional moment in the thread. The case is considered when a unifilar instrument (in relation to the method of arranging the magnet) registers the projection on a horizontal plane of the field intensity T, the east and west components of the field, and the declination and inclination. But if the force of gravity is used for creating a counterbalancing moment, then bifilar (variometers with a two-thread support system) and magnetic balances are required. Problems concerning irregularities in variometer assemblies and their operation, concerning the effect of permanent anomalies of the magnetic field on variometer readings, and concerning the effect of the variable magnetic field are thoroughly discussed. During the setting up of a variometer in a field of permanent anomalies, it is possible by appropriate orientation of the variometer's magnet to secure readings dependent only on the normal variation of one element. In the case of an anomalous induction field, none of the adjustments of the magnet will secure this effect.

The various methods of changing the sensitivity of variometers (magnetic, mechanical, and optical) are described in detail. Problems of the effect of temperature on variometer readings, the value of graduation, and also problems concerning the application of different methods of temperature compensation are covered in detail. The advantages and disadvantages of each method are indicated. The mutual effect of variometers located relatively close to one another is discussed. Given also is a description of an induction Z-variometer which differs in principle from vertical magnetic balances, and a number of impressions is given in connection with the system of a new universal variometer ensuring a more reliable registration of geomagnetic elements than magnetic variation instruments now in use. (Referativnyy Zhurnal-Geofizicheskaya, No 1, Jan 58, Abstract No 716, by G. N. Kalitina)

V. OCEANOGRAPHY

Underwater Photography at 10,000 Meters

S. Osokin, Capt 3d Rank, writing in the newspaper Sovetskiy Flot, describes a new Soviet underwater camera now used by Soviet oceanographers.

Scientists of a number of countries have for a long time striven to use cameras for studying the underwater world. Photographing at lesser depths was mastered a relatively long time ago. The other aim is obtaining photographs at great depths. This problem involves considerable technical

difficulties. To lower a camera to a depth of 8,000-9,000 meters, it is necessary to pay out about 12,000-14,000 meters of cable, which must support not only the weight of the instrument but also its own weight, amounting to several tons. Moreover, such a camera and supplementary apparatus must be protected from sea water under enormous pressure.

In the Soviet Union work on deep-water photography using automatic cameras is conducted by the Institute of Oceanology of the Academy of Sciences USSR. An underwater photographic device was built by Engr N. L. Zenkevich with a group of the institute's workers. Using this device, scientists have obtained several scores of photographs, made on the bottom of the Pacific Ocean. These photographs clearly show inhabitants of the sea bottom and details of their structure. The photographs are valuable additions to investigations of the underwater world by other means. With their aid the presence of bottom currents can be determined.

Zenkevich is continuing his work to improve the underwater apparatus. During the 25-month voyage of the Vityaz, its first under the IGY program, a new-model automatic camera with electrical controls was used. In one of the attempts 15-18 photographs of the ocean bottom were obtained with the camera. A total of 100 photographs at depths down to 5,820 meters were made during the voyage. With the aid of this camera the summit of the submarine mountain Admiral S. O. Makarov, which was discovered by Soviet oceanographers, was studied.

Unfortunately, the camera was flooded during an attempt to photograph the bottom of the deepest part of the world's oceans, the Mariana Trench.

A new photographic device was built by Zenkevich at the end of 1957. In the vertical frame of this instrument two thick-walled cylinders made of tough high-quality steel are fastened. The open ends of both of these cylinders are hermetically sealed with thick Plexiglas plates. The camera is housed in the upper cylinder and the light source in the lower.

On the second voyage of the Vityaz under the IGY, Soviet oceanographers obtained photographs of the ocean bottom at the record depth of about 10,000 meters. The record previously considered was 5,500 meters. This was made by an American, D. Owen, who used a single exposure camera.

On its last voyages the Vityaz successfully used stereoscopic photography, which gave much more detail of the bottom structure of the sea. In addition, the stereoscopic photographs made it possible to determine the heights of objects. The camera's construction makes it possible to work with it at depths down to 6,000 meters. During the Vityaz' second IGY voyage, over 130 stereophotographs of the bottom were obtained. (Moscow, Sovetskiy Flot, 23 Apr 58)

Soviet Pacific Expedition Returns

The complex expedition of the Institute of the Physics of the Earth imeni O. Yu. Shmidt has returned to Moscow. The expedition was engaged in conducting investigations in the Pacific Ocean under the IGY program.

In an interview given to a reporter from the newspaper Sovetskiy Flot, S. M. Zverev, Candidate of Geological-Mineralogical Sciences, deputy chief of the expedition, revealed that work during the more than 60-day voyage was done under severe meteorological conditions. Frequent storms, hurricane winds, and severe cold hampered the participants of the expedition but did not stop them from the excellent fulfillment of their obligations.

The aim of the Pacific Ocean geological-geophysical Expedition was to study the deep structure of the Earth's crust in the transition zone from the Asiatic continent to the Pacific Ocean in the region of the Kurile-Kamchatka arch. The region is the most interesting in the world with respect to geological-geophysical phenomena.

In recognition of the aid received by the expedition from members of the Soviet Pacific Fleet, Academician I. P. Bardin, vice-president of the Academy of Sciences USSR, sent IGY badges to those sailors who most distinguished themselves. (Moscow, Sovetskiy Flot, 10 Apr 58)

Mikhail Lomonosov Sails on Second IGY Voyage

The Mikhail Lomonosov, expeditionary ship of the Academy of Sciences USSR, on its second Atlantic voyage under the IGY program will take aboard a group of scientists from the German Democratic Republic at the port of Warnemuende.

The ship will have a complement of 62 scientific workers in addition to the crew. Detachments will conduct observations on hydrology, thermology, sea geology, marine wind waves, hydrochemistry, aerology, etc. More than 200 hydrological stations will be established, several of 24-hour duration.

Many instructive results were obtained from the experience of its first experimental voyage in the North Atlantic. Scientific apparatus was improved. For example, the turbulometer for determining temperature pulsations and current velocities formerly could operate in not more than a No 3 or No 4 sea; now its limit is raised to No 6.

The ship and its equipment have been prepared and carefully checked for its long voyage, which will last 3 1/2-4 months and will cover some 20,000 miles. The Lomonosov is scheduled to begin the first leg of its Atlantic survey, 1,200 miles long, on 5 March off Cape Finisterre, Spain.

This information was given in an interview with A. A. Ivanov, Doctor of Physicomathematical Sciences, chief of the expedition, a few days before the sailing of the Mikhail Lomonosov. (Moscow, Sovetskiy Flot, 26 Feb 58)

USSR Expands Geophysical Research Program in Antarctic

The Soviet observatory at Mirnyy has considerably expanded its research program since it was first established. In addition to observations on the structure of the upper atmosphere, members of the Second Antarctic Expedition took measurements of the absorption by the atmosphere of a vertically sounding radio beam in its passage from the surface of the Earth to the ionosphere and back. The geophysical detachment under S. Mansurov, began to register the intensity of radio waves of middle-latitude stations; the signals of these stations are reflected many times from the ionosphere before reaching Antarctica. The geophysicists also expanded the registration of the spectrum of variations of the Earth's magnetic field and of earth currents. For the first time, scientists at Mirnyy used an automatic apparatus developed in the USSR for photographing auroras, and they installed instruments and began the registration of changes in the intensity of cosmic rays.

At the beginning of the IGY, the installation of equipment was completely finished and the registration of earth currents, auroras, and seismic vibrations of the Earth's crust was begun in the region of the station Oazis. Magnetic observations were conducted at Oazis and Pionerskaya.

Simultaneously with the instrument registration of auroras at Mirnyy and Oazis, the scientists made visual observations in the interior of the continent at Pionerskaya and Vostok-I. Later, when the station Komsomol'skaya was established near the south geomagnetic pole, the registration of magnetic variations was conducted during a 2-week period. During the trip of a sled-tractor train into the interior for the organization of new scientific stations, absolute magnetic measurements were taken at the stopping places.

On arrival in the Antarctic, the scientists found that the actual problems were greater than they had anticipated. In organizing interior stations, they met with a number of difficulties. One of the main difficulties was the inability to deliver into the interior of the continent prefabricated, heavyweight, nonmagnetic huts for housing magnetic instruments and bulky equipment for ionospheric research. The geophysicists had

to equip themselves with saws and axes and to join the construction workers in Mirnyy in building lightweight huts, which could be transported into the interior by plane. To reduce the weight of equipment for ionospheric observations at Vostok, it was necessary to do experimental work in Mirnyy during stormy weather to produce lightweight radio masts and antennas. As a result, the equipment transported by plane to the ionospheric station at the south geomagnetic pole weighed only several tens of kilograms instead of several tons.

A preliminary analysis of observation material obtained by the geophysicists shows that the former theories regarding processes in the upper atmosphere above Antarctica, which had been formed on the basis of general reasoning, do not agree with actual conditions. The zone of maximum activity of magnetoionospheric disturbances of East Antarctica, in the area of operation of the Soviet expedition, lies considerably north of the coast above the ocean. All the Soviet stations are located south of this zone, so that the intensity of auroras observed by Soviet scientists is low. Even in Mirnyy, which is closer than all the other stations to the zone of maximum activity, the probability of the appearance of auroras amounts to barely 50 percent.

The seismic station at Mirnyy has registered a large number of earthquakes in various parts of the world. The earthquakes which are of considerable interest are those occurring along the lines of the Australian-Antarctic and South Pacific elevations of the ocean bottom.

A more complete processing of the materials of geophysical observations will soon be undertaken in several scientific research institutes, taking into consideration the data of observations made at other stations in the Arctic and Antarctic and in middle latitudes. -- S. Mansurov, chief of geophysical detachment (Moscow, Vodnyy Transport, 26 Apr 58)

Return of Second Antarctic Expedition

On 26 April, 112 members of the Second Complex Antarctic Expedition of the Academy of Sciences USSR arrived in Odessa. The Antarctic expedition members were met at the Odessa port by workers of the city, friends, and relatives. A short meeting was held at the port, during which Ladvishchenko, chairman of the city soviet executive committee, and Somov, Doctor of Geographical Sciences, welcomed the returning explorers. Treshnikov, Hero of Socialist Labor, answered in the name of the members of the Second Antarctic Expedition. (Moscow, Pravda, 26 Apr 58)

Achievements of Second Antarctic Expedition

The members of the Second Antarctic Expedition spent 14 months in the Antarctic. During that period, important research was done by the Soviet glaciologists headed by P. Shumskiy, Doctor of Geographical Sciences; the aerological detachment headed by O. Krichak, Candidate of Geographical Sciences; the geophysical detachment under S. Mansurov; and others.

The Soviet scientists made observations of the glacial cover, especially with the help of seismic depth soundings, and observations of glacier movement, and did laboratory research on the mechanical properties and the crystallophysics and thermophysics of snow and ice.

There has been a definite change in the formerly held theories regarding the thickness of the antarctic glacial cover, and new data have been obtained on the relief of the Earth's surface under the ice cap. It has been established that the basic types of rock, underlying the ice cover in the coastal zone of East Antarctica, are tens and hundreds of meters below the sea level and that they rise above sea level in only a few places. The depth of the glacial cover ranges from 200 meters near the coast to 3,000-3,500 meters in the central regions of the continent. Thus the amount of ice in Antarctica is much greater than had been assumed. Data have also been obtained on the temperature regime of the snow and ice cover. Valuable material has been collected on the history of the Quaternary glaciation of Antarctica, which makes it possible to compare the process of glaciation in the northern and southern hemispheres.

The origin of antarctic oases, i. e., areas of the continent which are free from glaciation at present, has been explained.

Ideas have been formed concerning the regime of atmospheric circulation in the troposphere and lower stratosphere above the Antarctic, which influences the climate and weather in a large part of the southern hemisphere.

The marine component of the expedition accomplished a great deal under the leadership of Prof I. Maksimov and O. Borshchevskiy on the Ob' and Lena. With the help of modern scientific equipment, the scientists on these expedition ships conducted systematic, complex studies of the oceans surrounding Antarctica. As a result, important changes have been made on the map in the configuration of the East Antarctic coastline.

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The Second Antarctic Expedition brought back important scientific materials. When these are summarized and studied, it will be possible to gain a better understanding of the sixth continent and the waters surrounding it.

Many scientific institutions took part in the complex expedition. The members of the Second Antarctic Expedition have strengthened the ties with foreign expeditions working in the Antarctic. Such contacts were established with scientists of Great Britain, Australia, the US, France, Japan, and other countries. Scientific information and results of research were exchanged regularly, and consultations were held on various subjects. The joint efforts of scientists of the Soviet Union and other countries have been very fruitful and have widened the scope of research under the IGY program. (Moscow, Vodnyy Transport, 26 Apr 58)

Temperature in Antarctic

According to a report from the station Sovetskaya in the interior of Antarctica, the temperature recorded at that station on 2 March was minus 63 degrees C. (Moscow, Gudok, 4 Mar 58)

Work of Aerial Detachments in Arctic

A group of airplanes which took part in the latest high-latitude expedition has returned to Moscow from the Central Arctic.

A correspondent of Izvestiya interviewed M. I. Shevelev, chief of Polar Aviation and Hero of the Soviet Union; D. N. Morozov, well-known polar navigator; and G. V. Volkov, who has taken part in many arctic flights.

According to a statement by Shevelev, the aerial detachment headed by pilot B. S. Osipov handled its assignment extremely well. In less than a month's time, 4 heavy four-engine planes, 5 IL-12 and IL-14 planes, 7 LI-2 planes, and one MI-4 helicopter transported over 300 tons of various kinds of freight from the mainland to the drift stations Severnyy Polyus-6 and Severnyy Polyus-7. During the past years, this work was usually done in 1 1/2-2 months. At the time the station Severnyy Polyus-1, headed by I. D. Papanin, was established on a drifting ice floe in the region of the North Pole, only 12-15 tons of equipment was transported.

Beginning on 1 April, the LI-2 plane crews, headed by M. P. Stupishin, Hero of the Soviet Union, also made a number of important flights with landings on drifting ice of the Central Arctic Basin, where more than 20 drifting automatic radiometeorological stations and radio beacons were set up.

It was difficult to replace the scientific staff and to deliver equipment to drift station Severnyy Polyus-7. It was impossible to find a single suitable and stable ice floe for landing heavy planes in the vicinity of the station. Such a "landing field" was found only at a distance of 60 kilometers from the camp, and the freight was transported from there to the camp by helicopter.

In addition to this work, the planes piloted by A. N. Pimenov and I. I. Cherevichnyy conducted extensive ice reconnaissance in all sectors of the Soviet Arctic up to the highest latitudes.

During the greater part of 1957, ice specialists gave particular attention to the movement of the Taymyr ice pack (ledyanoy massiv), which moved in from the north and blocked Proliv Vil'kitskogo.

In the opinion of ice forecasters, navigation during 1958 will be particularly difficult. The most complicated ice conditions are in the eastern regions, i. e., in the Laptev, East Siberian, and Chukchee seas, and also further west, in the Kara Sea. Even the autumnal and winter ice is still very solid and almost 2 meters thick, and the polar ice pack floes are up to 5 meters thick.

To conduct ships through the ice this year, the airplanes and ships plan to make experimental use of photoradiotelegraphic and television equipment. In addition, polar aviation will soon be equipped with such powerful, high-speed planes as the turborprop IL-18 and AN-10 planes.

(Moscow, Izvestiya, 11 May 58)

Expedition "Sever-10"

A Polar Aviation airplane left Moscow on 5 April for the North Pole, carrying staff members for the drift stations Severnyy Polyus-6 and Severnyy Polyus-7.

The station Severnyy Polyus-6 will have a new staff of 19 persons, headed by the experienced polar scientists, S. T. Serlapov. The same number of personnel will be flown to Severnyy Polyus-7, where the staff will operate under the supervision of N. A. Belov.

The replacement of staffs at the drift stations is only one task of the aerial expedition headed by M. M. Nikitin. The expedition is also charged with doing scientific research work under the IGY program, collecting information on atmospheric conditions and on the ice in the Arctic Basin, and making other types of observations.

The third task of the high-latitude expedition is to conduct research in connection with a study of the ice island on which Severnyy Polyus-6 is located. The prolonged existence of this ice island is explained by the fact that the ice cover in this part of the Arctic Ocean is more massive than in other parts. A detailed study of the ice island will be of great interest to scientists, since it will help explain the origin of similar ice islands in the polar basin. (Moscow, Literatura i Zhizn', 6 Apr 58)

Lena in Greenland Sea

The polar expedition ship Lena, which has a displacement of 12,600 tons, left Murmansk on a long scientific voyage in connection with the IGY program. The captain of the Lena is A. I. Vetrov, who took part in two voyages to the Antarctic.

The members of the oceanographic expedition of the Arctic Institute aboard the Lena will explore the northern part of the Greenland Sea. The expedition is headed by V. Shamont'yev, hydrologist.

Soviet scientists have been exploring the Greenland Sea for the past few years. However, the northern part of the sea is being explored this spring for the first time. This will enable the scientists to follow the seasonal fluctuations of hydrological processes. The expedition will take one month. (Baku, Bakinskiy Rabochiy, 12 Mar 58)

Expeditions of Arctic Institute

Continuous observations are being conducted in the Arctic basin, mainly along the coast of Eurasia and on the islands of the Arctic Ocean. To obtain information on conditions in the open parts of the polar seas, the Arctic Institute sends annual expeditions to the Arctic.

At the beginning of March, an expedition on the Lena was sent to the Greenland Sea to conduct complex oceanographic research and other scientific observations under the IGY program. These investigations are being continued. There is reason to believe that they will provide scientists with interesting data on the water and heat exchange between the Arctic Ocean and the Atlantic Ocean. A study of the elements of the hydrological regime is of great interest for the development and improvement of ice forecasting methods to be used along the Northern Sea Route.

During 1957, Soviet polar scientists were able to reach the central part of the Nansen Rise, which had not been explored previously. The depth at this place turned out to be much greater than expected, i. e., up to 3,500 meters. It was discovered that the bottom of the sea in this area is crossed by a deep channel, extending in a meridional direction. This discovery has great significance for explaining the water exchange between the Atlantic and Arctic oceans.

Members of a high-latitude aerial expedition recently arrived in the Arctic by airplane. Staffs at the drift stations Severnyy Polyus-6 and Severnyy Polyus-7 will soon be replaced. During a one-year period, the drift stations conducted 6,000 meteorological and over 4,000 actinometric observations, launched more than 2,000 radiosondes and pilot balloons, made about 1,000 measurements of ocean depths, and conducted numerous observations of the movement of ocean water.

The material collected will contribute substantially to the information previously obtained by expeditions and scientific stations and will provide more correct data on the nature of the Central Arctic. A study of the drift of stations during the past year has provided new, interesting data on the drift of ice. The station staff of Severnyy Polyus-6 determined that the drift of the ice island was fairly closely related to the changes in the speed and direction of the wind. At the same time it was observed that in the region of the drift there was a general tendency of the ice to move in a northwest direction. Even in the presence of west-southwest winds, the station moved slowly but persistently to the

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northwest under the influence of constant currents. The new staffs at the polar drift stations will continue investigations of the Arctic Ocean. Special attention will be devoted to the study of magnetic phenomena, auroras, and other geophysical phenomena.

The high-latitude aerial expedition will distribute a number of "Yakha" radio beacons in the Central Arctic, most of which are equipped with drifting automatic radiometeorological stations. As a result, the weather service will receive, during 1958, data on the drift of ice obtained by radio bearings from radio beacons, as well as data covering vast areas of the polar basin concerning the temperature and pressure of the air and the speed and direction of the wind. This information will provide a substantial supplement to the data on weather conditions in the regions most remote from the mainland and will improve synoptic weather forecasting service for navigation in the Arctic. At the locations of plane landings, scientists will conduct observations of temperature, water salinity, relief of the sea bottom, and condition of the ice.

Also, it is planned to conduct navigational ice reconnaissance. On the basis of data obtained, the ships will determine the best possible course to take.

Three oceanographic expeditions will operate simultaneously in the Arctic on the ships Toros, Polyarnik, and Lomonosov. They will conduct studies of the hydrological and ice regimes of the Chukchee, East Siberian, Laptev, Kara, and Barents seas; will collect material for safeguarding navigation along the Northern Sea Route; and will do other types of research under the IGY program. (Moscow, Sovetskiy Flot, 4 Apr 58)

Soviets Prepare Map of Greenland Sea

The Polar Research Institute in Leningrad has prepared a map of the Greenland Sea on the basis of data collected by the Soviet IGY vessel Lena. The map gives a topography of the ocean floor, the direction of ice flow, and the meteorological characteristics of the area. (Budapest, Technika, No 4, Apr 58, p 7)

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